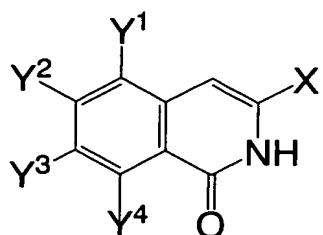


CLAIMS

1. A compound represented by the following formula (1):
[Formula 1]



(1)

[wherein,

Y^1 and Y^4 are independently selected from a hydrogen atom and a halogen atom,

either one of Y^2 and Y^3 represents $-NR^1R^2$, and the other represents a hydrogen atom or a halogen atom;

X represents an aryl group or a heteroaryl group, and the aryl group or heteroaryl group may be substituted with one or more substituents selected from Group A;

Group A consists of a C_{1-8} alkyl group (wherein the alkyl group may be substituted with one or more substituents selected from a halogen atom, an aryl group, a heteroaryl group, $-OR^{11}$, and $-NR^{12}R^{13}$), a C_{2-7} alkenyl group (wherein the C_{2-7} alkenyl group may be substituted with one or more substituents selected from a halogen atom, a C_{1-8} alkyl group, an aryl C_{1-6} alkyl group, an aryl group, and a heteroaryl group), a C_{2-7} alkynyl group (wherein the C_{2-7} alkynyl group may be substituted with one or more substituents selected from a halogen atom, a C_{1-8} alkyl

group, an aryl C₁₋₆ alkyl group, an aryl group, and a heteroaryl group), a halogen atom, a hydroxyl group, an aryl group, a heteroaryl group, a cyano group, an amino group (wherein the nitrogen atom of the amino group may be substituted with one or two substituents selected from a C₁₋₈ alkyl group, which may be substituted with -OR¹¹ or -NR¹²R¹³, an aryl group, an aryl C₁₋₆ alkyl group, and a heteroaryl group), -S(O)_nR¹⁴ (wherein n represents an integer between 0 and 2), a C₁₋₆ alkoxy group (wherein the alkoxy group may be substituted with one or more groups selected from an aryl group, a heteroaryl group, -OR¹¹, -NR¹²R¹³, and a halogen atom), a 4- to 7-membered hetero ring group (wherein the hetero ring group may be substituted with one or more substituents selected from Group D), an aryloxy group, a heteroaryloxy group, and a C₁₋₆ alkylenedioxy group; wherein R¹¹, R¹², R¹³, and R¹⁴ are independently selected from a hydrogen atom, a C₁₋₈ alkyl group (wherein the alkyl group may be substituted with one or more substituents selected from a halogen atom, a hydroxyl group, a C₁₋₆ alkoxy group, an amino group, a C₁₋₆ alkylamino group, a di(C₁₋₆ alkyl)amino group, an aryl group, and a heteroaryl group), an aryl group, and a heteroaryl group; or R¹² and R¹³, together with nitrogen to which they are bonded, may form a 4- to 7-membered hetero ring containing at least one nitrogen atom;

R¹ represents a hydrogen atom, or a C₁₋₈ alkyl group that may be substituted with one or more substituents selected from Group B;

R² represents a C₁₋₈ alkyl group substituted with one or more substituents selected from Group B, -COOR³, -COR⁴, -COSR⁵, -CONR⁶R⁷, -NR²²R²³, or -N=CR²⁴R²⁵; or R¹ and R², together with a nitrogen atom to which they are bonded, may form a 4- to 10-membered hetero ring containing at least one nitrogen atom (wherein the hetero ring may be substituted with one or more substituents selected from Group C); wherein

R³ represents a hydrogen atom, a C₁₋₈ alkyl group, a C₂₋₇ alkenyl group, a C₂₋₇ alkynyl group (wherein the alkyl group, alkenyl group, and alkynyl group may be substituted with one or more substituents selected from a halogen atom, a hydroxyl group, a C₁₋₆ alkoxy group (wherein the alkoxy group may be substituted with one or more substituents selected from a hydroxyl group, a C₁₋₆ alkoxy group, and a phenyl group), a C₃₋₈ cycloalkyl group, an aryl group, and a heteroaryl group), a C₃₋₈ cycloalkyl group, an aryl group, or a heteroaryl group;

R⁴ is selected from a hydrogen atom, a C₁₋₈ alkyl group that may be substituted with one or more R²⁰'s, an aryl group, and a heteroaryl group;

R⁵ is selected from a hydrogen atom, a C₁₋₈ alkyl group, an aryl group, and a heteroaryl group;

R²⁰ represents a hydroxyl group, a halogen atom, an aryl group, a heteroaryl group, a C₁₋₆ alkoxy group (wherein the alkoxy group may be substituted with one or more substituents selected from a halogen atom, an aryl group, and a heteroaryl group), an aryloxy group, a heteroaryloxy

group, an amino group (wherein the nitrogen atom of the amino group may be substituted with one or two substituents selected from a C₁₋₈ alkyl group, an aryl group, an aryl C₁₋₆ alkyl group, a heteroaryl group, and -COOR²¹), or a 4- to 7-membered hetero ring group containing at least one nitrogen atom (wherein the hetero ring group may be substituted with a C₁₋₈ alkyl group);

R²¹ represents a C₁₋₈ alkyl group, an aryl C₁₋₆ alkyl group, or an aryl group;

R⁶ and R⁷ are independently selected from a hydrogen atom, a C₁₋₈ alkyl group, an aryl group, and a heteroaryl group;

R²² and R²³ are independently selected from a hydrogen atom, a C₁₋₈ alkyl group, an aryl group, and a heteroaryl group;

R²⁴ and R²⁵ are independently selected from a hydrogen atom, a C₁₋₈ alkyl group, an aryl group, and a heteroaryl group;

Group B consists of a halogen atom, a C₁₋₆ alkylcarbonyl group, a C₁₋₆ alkylaminocarbonyl group, a C₁₋₆ alkoxy carbonyl group, an aryl group (wherein the aryl group may be substituted with one or more substituents selected from a halogen atom, a C₁₋₈ alkyl group, a C₁₋₈ haloalkyl group, a hydroxyl group, a C₁₋₆ alkoxy group, and a C₁₋₆ haloalkoxy group), a heteroaryl group, -OR³¹, and -NR³²R³³; wherein

R³¹, R³², and R³³ are independently selected from a hydrogen atom, a C₁₋₈ alkyl group (wherein the alkyl group may be substituted with one or more substituents selected

from a halogen atom, a hydroxyl group, a C₁₋₆ alkoxy group, an aryl group, an amino group, a C₁₋₆ alkylamino group, and a di(C₁₋₆ alkyl)amino group), an aryl group, a heteroaryl group, and -COOR³⁴; wherein R³⁴ represents a C₁₋₈ alkyl group, an aryl C₁₋₆ alkyl group, or an aryl group; or

R³² and R³³, together with a nitrogen atom to which they are bonded, may form a 4- to 7-membered hetero ring containing at least one nitrogen atom (wherein the hetero ring group may be substituted with one or more groups selected from Group D);

Group C consists of an aryl group, a heteroaryl group, a C₁₋₆ alkylcarbonyl group, a C₁₋₆ alkylaminocarbonyl group, a C₁₋₆ alkoxy carbonyl group, a hydroxyl group, a C₁₋₈ alkyl group, a C₁₋₆ alkoxy group (wherein the alkyl group and alkoxy group may be substituted with one or more substituents selected from a halogen atom, an aryl group, a heteroaryl group, -NR⁴¹R⁴², and -OR⁴³), an aryloxy group, and a heteroaryloxy group; wherein

R⁴¹, R⁴², and R⁴³ are independently selected from a hydrogen atom, a C₁₋₈ alkyl group (wherein the alkyl group may be substituted with one or more substituents selected from a halogen atom, a hydroxyl group, a C₁₋₆ alkoxy group, an amino group, a C₁₋₆ alkylamino group, and a di(C₁₋₆ alkyl)amino group), an aryl C₁₋₆ alkyl group, an aryl group, and a heteroaryl group; or

R⁴¹ and R⁴², together with a nitrogen atom to which they are bonded, may form a 4- to 7-membered hetero ring containing at least one nitrogen atom; and

Group D consists of a halogen atom, an aryl group, a heteroaryl group, an aryloxy group, a heteroaryloxy group, an amino group (wherein the nitrogen atom of the amino group may be substituted with one or two substituents selected from a C₁₋₈ alkyl group, a hydroxy C₁₋₆ alkyl group, a C₁₋₆ alkoxy C₁₋₆ alkyl group, a C₁₋₆ alkylamino C₁₋₆ alkyl group, a di(C₁₋₆ alkyl)amino C₁₋₆ alkyl group, an aryl group, an aryl C₁₋₆ alkyl group, and a heteroaryl group), a hydroxyl group, a C₁₋₆ alkoxy group (wherein the alkoxy group may be substituted with one or more substituents selected from a halogen atom, a hydroxyl group, a C₁₋₆ alkoxy group, a C₁₋₆ alkylamino group, and di(C₁₋₆ alkyl)amino group), a C₁₋₆ alkoxycarbonyl group, a C₁₋₈ alkyl group (wherein the alkyl group may be substituted with one or more substituents selected from a halogen atom, a hydroxyl group, a C₁₋₆ alkoxy group, a C₁₋₆ alkoxy carbonyl group, an amino group, an aryl group, a heteroaryl group, a C₁₋₆ alkylamino group, and a di(C₁₋₆ alkyl)amino group)], a prodrug thereof, or a pharmaceutically acceptable salt thereof.

2. The compound, prodrug thereof, or pharmaceutically acceptable salt thereof according to claim 1, wherein Y³ represents -NR¹R².

3. The compound, prodrug thereof, or pharmaceutically acceptable salt thereof according to claim 1 or 2, wherein Y¹, Y², and Y⁴ represent a hydrogen atom; Y³ represents -NR¹R²;

X represents an aryl group or a heteroaryl group, and the aryl group may be substituted with one or more

substituents selected from Group A;

Group A consists of a C₁₋₈ alkyl group (wherein the alkyl group may be substituted with one or more substituents selected from a halogen atom and -NR¹²R¹³), a halogen atom, a hydroxyl group, an aryl group, an amino group (wherein the nitrogen atom of the amino group may be substituted with one or two substituents selected from a C₁₋₈ alkyl group and an aryl group), -SR¹⁴, a C₁₋₆ alkoxy group (wherein the alkoxy group may be substituted with one or more groups selected from -OR¹¹ and a halogen atom), and a 4- to 7-membered hetero ring group (wherein the nitrogen atom of the hetero ring group may be substituted with one or two substituents selected from a C₁₋₈ alkyl group and a C₁₋₆ alkoxy carbonyl group); wherein

R¹¹, R¹², R¹³, and R¹⁴ are independently selected from a hydrogen atom, a C₁₋₈ alkyl group, and an aryl group; or R¹² and R¹³, together with nitrogen to which they are bonded, may form a 4- to 7-membered hetero ring containing at least one nitrogen atom;

R¹ represents a hydrogen atom, or a C₁₋₈ alkyl group that may be substituted with one or more substituents selected from Group B;

R² represents a C₁₋₈ alkyl group substituted with one or more substituents selected from Group B, -COOR³, -COR⁴, -COSR⁵, -CONR⁶R⁷, -NR²²R²³, or -N=CR²⁴R²⁵; or R¹ and R², together with a nitrogen atom to which they are bonded, may form a 4- to 10-membered hetero ring containing at least one nitrogen atom (wherein the hetero ring may be substituted

with one or more substituents selected from Group C);
wherein

R³ represents a C₁₋₈ alkyl group (wherein the alkyl group may be substituted with one or more substituents selected from a halogen atom, a hydroxyl group, a C₁₋₆ alkoxy group (wherein the alkoxy group may be substituted with one or more substituents selected from a hydroxyl group, a C₁₋₆ alkoxy group, and a phenyl group), a C₃₋₈ cycloalkyl group, an aryl group, and a heteroaryl group), a C₂₋₇ alkenyl group, a C₂₋₇ alkynyl group, a C₃₋₈ cycloalkyl group, an aryl group, or a heteroaryl group;

R⁴ is selected from a hydrogen atom, a C₁₋₈ alkyl group that may be substituted with one or more R²⁰'s, an aryl group, and a heteroaryl group, and R⁵ is selected from a C₁₋₈ alkyl group and an aryl group;

R²⁰ represents a hydroxyl group, a halogen atom, an aryl group, a heteroaryl group, a C₁₋₆ alkoxy group, an aryloxy group, an aryl C₁₋₆ alkoxy group, an amino group (wherein the nitrogen atom of the amino group may be substituted with one or two substituents selected from a C₁₋₈ alkyl group, an aryl group, and -COOR²¹), or a 4- to 7-membered hetero ring group containing at least one nitrogen atom (wherein the hetero ring group may be substituted with a C₁₋₈ alkyl group);

R²¹ represents a C₁₋₈ alkyl group, an aryl C₁₋₆ alkyl group, or an aryl group;

R⁶ and R⁷ are independently selected from a hydrogen atom, a C₁₋₈ alkyl group, and an aryl group;

R^{22} , R^{23} , R^{24} , and R^{25} are independently selected from a hydrogen atom, a C_{1-8} alkyl group, an aryl group, and a heteroaryl group;

Group B consists of a halogen atom, a C_{1-6} alkoxycarbonyl group, an aryl group, $-OR^{31}$, and $-NR^{32}R^{33}$; wherein

R^{31} , R^{32} , and R^{33} are independently selected from a hydrogen atom, a C_{1-8} alkyl group, an aryl C_{1-6} alkyl group, an aryl group, a heteroaryl group, and $-COOR^{34}$; wherein R^{34} represents a C_{1-8} alkyl group, an aryl C_{1-6} alkyl group, or an aryl group; or

R^{32} and R^{33} , together with a nitrogen atom to which they are bonded, may form a 4- to 7-membered hetero ring containing at least one nitrogen atom; and

Group C consists of a C_{1-6} alkoxycarbonyl group, a hydroxyl group, a C_{1-8} alkyl group, an aryl C_{1-6} alkoxy C_{1-8} alkyl group, a hydroxy C_{1-8} alkyl group, an aryloxy group, and a heteroaryloxy group.

4. The compound, prodrug thereof, or pharmaceutically acceptable salt thereof according to any one of claims 1 to 3, wherein R^1 and R^2 , together with a nitrogen atom to which they are bonded, form a 4- to 10-membered hetero ring containing at least one nitrogen atom, wherein the hetero ring may have a substituent selected from Group C.

5. The compound, prodrug thereof, or pharmaceutically acceptable salt thereof according to any one of claims 1 to 4, wherein Y^2 or Y^3 represents a morpholinyl group, an azetidinyl group, a pyrrolidinyl group, or piperidinyl

group, and the hetero ring group may be substituted with one or more substituents selected from a hydroxyl group and a hydroxy C₁₋₆ alkyl group.

6. The compound, prodrug thereof, or pharmaceutically acceptable salt thereof according to any one of claims 1 to 5, wherein Y² or Y³ represents a morpholinyl group, an azetidinyl group, a pyrrolidinyl group, a 3-hydroxypyrrolidinyl group, a 2-hydroxymethylpyrrolidinyl group, a 3-hydroxymethylpyrrolidinyl group, a piperidinyl group, a 3-hydroxypiperidinyl group, a 4-hydroxypiperidinyl group, a 2-hydroxymethylpiperidinyl group, a 3-hydroxymethylpiperidinyl group, a 4-hydroxymethylpiperidinyl group, or a 4-hydroxy-4-hydroxymethylpiperidinyl group.

7. The compound, prodrug thereof, or pharmaceutically acceptable salt thereof according to any one of claims 1 to 3, wherein

R¹ represents a hydrogen atom or a C₁₋₈ alkyl group (wherein the alkyl group may be substituted with one or more substituents selected from Group B); and

R² represents a C₁₋₈ alkyl group substituted with one or more substituents selected from Group B, -COOR³, or -COCH₂NHCOOR²¹.

8. The compound, prodrug thereof, or pharmaceutically acceptable salt thereof according to any one of claims 1 to 3, wherein

R¹ represents a hydrogen atom; and

R² represents -COOR³, -COSR⁵, -CONR⁶R⁷, or -COR⁴.

9. The compound, prodrug thereof, or pharmaceutically acceptable salt thereof according to any one of claims 1 to 3, wherein R² represents -COOR³.
10. The compound, prodrug thereof, or pharmaceutically acceptable salt thereof according to claim 9, wherein R³ represents a C₁₋₈ alkyl group, a C₂₋₇ alkenyl group, or a C₂₋₇ alkynyl group (wherein the alkyl group, alkenyl group, and alkynyl group represent a halogen atom, a hydroxyl group, or a C₁₋₆ alkoxy group (wherein the alkoxy group may be substituted with one or more substituents selected from a hydroxyl group, a C₁₋₆ alkoxy group, and a phenyl group)).
11. The compound, prodrug thereof, or pharmaceutically acceptable salt thereof according to claim 10, wherein R³ represents a C₁₋₈ alkyl group that is substituted with one or more hydroxyl groups, a C₂₋₇ alkenyl group that is substituted with one or more hydroxyl groups, or a C₂₋₇ alkynyl group that is substituted with one or more hydroxyl groups.
12. The compound, prodrug thereof, or pharmaceutically acceptable salt thereof according to claim 11, wherein R³ represents a C₁₋₆ alkyl group that is substituted with one or more hydroxyl groups.
13. The compound, prodrug thereof, or pharmaceutically acceptable salt thereof according to any one of claims 1 to 3 and 7, wherein Y² or Y³ represents a bis(hydroxy C₁₋₆ alkyl)amino group, a methyl(hydroxy C₁₋₆ alkyl)amino group, a hydroxy C₁₋₆ alkylamino group, a methyl(morpholinyl C₁₋₆ alkyl)amino group, an amino C₁₋₆ alkylamino group, a C₁₋₆

alkoxycarbonylamino group, or a hydroxy C₁₋₆ alkoxycarbonylamino group.

14. The compound, prodrug thereof, or pharmaceutically acceptable salt thereof according to any one of claims 1 to 3, 7 and 8, wherein Y² or Y³ represents a bis(2-hydroxyethyl)amino group, a methyl(2-hydroxyethyl)amino group, a 2-hydroxyethylamino group, a methyl(2-morpholin-4-ylethyl)amino group, a methyl(2-aminoethyl)amino group, or a 2-hydroxyethyloxycarbonylamino group.

15. The compound, prodrug thereof, or pharmaceutically acceptable salt thereof according to any one of claims 1 to 14, wherein X represents a phenyl group or a heteroaryl group, and the phenyl group or heteroaryl group may be substituted with one or more substituents selected from Group A.

16. The compound, prodrug thereof, or pharmaceutically acceptable salt thereof according to any one of claims 1 to 14, wherein X represents a phenyl group, and the phenyl group may be substituted with one or more substituents selected from Group A.

17. The compound, prodrug thereof, or pharmaceutically acceptable salt thereof according to any one of claims 1 to 14, wherein

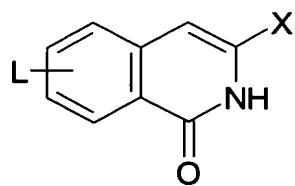
X represents a phenyl group or a heteroaryl group, and the phenyl group or heteroaryl group may be substituted with one or more substituents selected from Group A; and

Group A consists of a C₁₋₈ alkyl group that is substituted with one or more halogen atoms, an aryl group,

a C₁₋₆ alkylthio group, a di(C₁₋₆ alkyl)amino group, a 4- to 7-membered hetero ring group containing at least one nitrogen atom, a C₁₋₈ alkyl group, a C₂₋₇ alkenyl group, a C₂₋₇ alkynyl group, a C₁₋₆ alkoxy group (wherein the alkoxy group may be substituted with one or more halogen atoms), and a hydroxyl group.

18. The compound, prodrug thereof, or pharmaceutically acceptable salt thereof according to claims 1 to 17, wherein X represents a phenyl group, and the phenyl group may be substituted with one or more substituents selected from an ethyl group, a trifluoromethyl group, a trifluoromethoxy group, a methylthio group, a methoxy group, a chloro group, a phenyl group, a dimethylamino group, a morpholinyl group, a piperidinyl group, and a pyrrolidinyl group.

19. A compound represented by the following formula IV:
[Formula 2]



IV

(wherein X represents a phenyl group or a heteroaryl group, and the phenyl group or heteroaryl group may be substituted with one or more substituents selected from Group A; and L represents a halogen atom that is bonded to the 6- or 7- position on an isoquinolone ring).

20. A method for producing the compound according to

claim 1, which comprises amination of the compound according to claim 19.

21. A pharmaceutical composition, which comprises, as an active ingredient, the compound, prodrug thereof, or pharmaceutically acceptable salt thereof according to any one of claims 1 to 18.

22. A therapeutic or preventive agent used for malignant tumor, which comprises, as an active ingredient, the compound, prodrug thereof, or pharmaceutically acceptable salt thereof according to any one of claims 1 to 18.

23. The therapeutic or preventive agent according to claim 22, wherein the malignant tumor is solid cancer.